

Research Article

Properties of Sago Particleboards Resinated with UF and PF Resin

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The sago processing industry in Mukah, Sarawak, had generated huge amount of sago waste after the milling process and scientists have employed the waste into composite material. In this work, sago residues were mixed with the Phenol Formaldehyde (PF) and Urea Formaldehyde (UF) for particleboard fabrication. The fabrication and testing methods are based on JIS A 5908 Standard. A single layer particleboard using sago particles was fabricated at targeted density of 600 kg/m³. Particles with weight fractions of 90%, 85%, and 80% with two different matrices were used in the fabrication. The results demonstrated that the samples with different weight fraction and matrix have great influence on the mechanical properties such as MOR, MOE, Young's Modulus, tensile strength, impact strength, screw test, and internal bonding. The sago UF/PF particleboard only displays single stage decomposition. All the panels underwent physical tests which are water absorption and thickness swelling. The combination of sago particles with UF/PF can be utilized for general indoor application purposes such as furniture manufacturing. Sago particleboard made by UF/PF provided the advantages like optimized performance, minimized weight and volume, cost effectiveness, chemical resistance, and resistance to biodegradation.

1. Introduction

The demand of wooden materials has grown over the years with the increasing of population and new application area [1]. This had caused significant pressure on the forest resources and the cost that leads to high demand. To overcome the problem, researchers had found an alternative using the agrofibre combined with thermoplastic or thermoset as composites to replace wood supply [1]. Agricultural material or biomaterial plays an important role in the composites and furniture industries. Using natural fibres as reinforcing agents in composites contributes to a positive environment where raw materials are fully utilized [2]. Bioresources have provided us with the advantages like multifunctionality in application, flexibility in characteristics, lower production cost, biodegradability, and wide distribution all over the world [3, 4]. Natural fibres such as jute, hemp, kenaf, sisal, and rice husks have been investigated for use in the composites industries due to their advantages [3].

Research found that a large amount of binder is being used in particleboard fabrication which accounts for up to 32% of the manufacturing cost [5]. Various types of binders have been used in the manufacture of particleboards. The binders are classified as interior or exterior use based on the requirement and their response to moisture and temperature. Recently, the researchers had mentioned that binders such as Urea Formaldehyde (UF), Phenol Formaldehyde (PF), Phenol-Resorcinol Formaldehyde (PRF), and Melamine-Formaldehyde (MF) were used in the particleboard fabrication [5].

In Sarawak, approximately 7 tons of sago pith waste was produced per day from a single sago starch processing mill [6]. The residues from its production were discharged into the river, burnt in field, or deposited in factory compound which can lead to serious environmental problems. Safe disposal system or converting this waste into a useful product is a possible way for controlling the pollution and partial substitution of raw materials in industrial application.